

What is claimed is:

- 1 1. A antenna apparatus, comprising:
 - 2 a digital communications channel for receiving a digital control signal
 - 3 including antenna pattern position control information;
 - 4 control circuitry, coupled to the digital communications channel, the
 - 5 control circuitry including a direction control device for generating at least one antenna
 - 6 pattern position control signal from said digital control signal; and
 - 7 a controllable antenna element assembly having a steerable antenna
 - 8 pattern including a plurality of lobes and at least one null, the controllable antenna
 - 9 element assembly being responsive to said at least one antenna pattern position control
 - 10 signal.
- 1 2. The apparatus of claim 1, wherein said digital communications channel is a serial
- 2 bus.
- 1 3. The apparatus of claim 1, wherein said communications channel is implemented
- 2 using a coaxial cable also used to output signals received by said controllable antenna
- 3 element assembly.
- 1 4. The apparatus of claim 1,
 - 2 wherein said digital control signal includes an antenna position portion
 - 3 and a gain control portion, and
 - 4 wherein the control circuitry includes a gain decoder for generating a gain
 - 5 control signal as a function of the gain control portion of said control signal.
- 1 5. The apparatus of claim 4,
 - 2 wherein said digital control signal further includes a channel number
 - 3 portion, and

4 wherein the control circuitry further includes channel number processing
5 circuitry for generating a tuning voltage as a function of the channel number portion of
6 said digital control signal.

1 6. The apparatus of claim 5, further comprising a tuning circuit coupled to said
2 antenna element assembly, the tuning circuit being responsive to the tuning voltage.

1 7. The apparatus of claim 4,

2 wherein said digital control signal further includes a polarization control
3 portion, and

4 wherein the control circuitry further includes a polarization control circuit
5 coupled to said antenna element assembly.

1 8. The apparatus of claim 6, further comprising:

2 a memory device including antenna capabilities information.

1 9. The apparatus of claim 8, wherein said controllable antenna element assembly
2 includes:

3 a plurality of individual antenna elements; and

4 at least one switch being coupled to each of the individual antenna
5 elements, each switch being coupled to said direction control device.

1 10. The apparatus of claim 8, wherein said control circuitry includes at least one
2 integrated circuit for performing a decoding operation on at least a portion of said digital
3 control signal.

1 11. The antenna apparatus of claim 10, further comprising a coupling device
2 including at least three connections, the first connection for coupling said digital
3 communication channel to a control line of a receiver, the second connection for coupling
4 said controllable antenna element assembly to a signal input of said receiver, and a third
5 connection for coupling the control circuitry to a power supply line of said receiver.

1 12. A receiver apparatus, comprising:
2 a tuner for receiving a broadcast signal from an antenna device;
3 a received broadcast signal processing circuit and for generating at least
4 one signal measurement value from said received broadcast signal;
5 an antenna controller for generating a digital antenna control signal
6 including at least one of gain information, polarization control information, and channel
7 number information, in addition to antenna pattern position control information, the
8 antenna pattern position control information being determined by said antenna controller
9 as a function of said at least one signal measurement value; and
10 a communications channel for outputting the digital antenna control signal
11 to said antenna device.

1 13. The apparatus of claim 12, wherein said received broadcast signal processing
2 circuit is a demodulator and wherein said at least one signal measurement value is a
3 signal to noise estimate.

1 14. The apparatus of claim 12, wherein said communications channel is a serial data
2 bus.

1 15. The apparatus of claim 14, wherein said antenna controller includes:
2 an antenna control and positioning routine used to generate said digital
3 antenna control signal.

1 16. The apparatus of claim 15, wherein said antenna control and position routine
2 includes instructions for rotating said antenna pattern through a plurality of positions to
3 select an optimum position based on said at least one measurement value without human
4 input.

1 17. The apparatus of claim 15, further comprising:
2 stored antenna information received from an antenna device via said serial
3 data bus.

1 18. The apparatus of claim 17, further comprising:
2 stored antenna channel state information specifying settings to be used for
3 a plurality of controllable antenna features for each of a plurality of receiver channel
4 settings.

1 19. The apparatus of claim 14, further comprising:
2 a multi-terminal adapter for connecting said apparatus to an antenna
3 device, the multi-terminal adapter including a first terminal for receiving said broadcast
4 signal from the antenna device, a second terminal for supplying power to said antenna
5 device; and a third terminal for coupling said serial bus to the antenna device.

1 20. The apparatus of claim 14, wherein the received broadcast signal processing
2 circuit is a television signal demodulator circuit.

1 21. A receiver apparatus, comprising:

2 a tuner for receiving a broadcast signal from an antenna device;

3 a received broadcast signal processing circuit and for generating at least

4 one signal measurement value from said received broadcast signal;

5 an antenna controller coupled to said broadcast signal processing circuit

6 for generating digital antenna control signals used to automatically adjust the position of

7 an antenna pattern of said antenna device, the antenna pattern including a plurality of

8 lobes and at least one null so that the null is orientated in the direction of a source of

9 signal interference; and

0 a communications channel for outputting the digital antenna control

1 signals to said antenna device.

1 23. The receiver apparatus of claim 22, wherein said antenna controller further
2 comprises:

3 means for including channel information in at least some of said digital
4 antenna control signals.

1 24. The receiver apparatus of claim 22, wherein said antenna controller further
2 comprises:

3 means for including antenna polarization information in at least some of
4 said digital antenna control signals.

1 25. A television, comprising:

2 an antenna device having an electronically steerable antenna pattern, the
3 antenna pattern including at least a front lobe, a rear lobe and at least one null, the
4 antenna device including:

5 a control circuit for controlling the position of said antenna pattern
6 in response to digital control signals;

7 a receiver coupled to said antenna device, the receiver including;

8 a demodulator for demodulating broadcast signals received
9 from said antenna device and for generating at least one signal
10 measurement value; and

11 antenna control circuitry for generating a plurality of said
12 digital control signals to steer said antenna pattern as a function of said at
13 least one signal measurement value; and

14 a display device coupled to said demodulator for displaying images
15 generated from said received broadcast signals.

1 26. The television of claim 21, further comprising:

2 a television housing for housing both said antenna device and said
3 receiver.

1 27. The television of claim 21, further comprising:

2 a serial data bus for coupling the antenna control circuitry to the antenna
3 device.

1 28. The television of claim 27, wherein said antenna control circuitry includes means
2 for determining when said antenna pattern position is in a position which produces less
3 signal interference than at least one other antenna pattern position.

1 29. A multi-bit antenna control signal used for controlling characteristics of an
2 antenna, the control signal comprising:

3 a plurality of signal components representing at least two of: a direction
4 field including antenna pattern direction control information, a gain field including
5 antenna gain information, a channel number field including a channel number, and a
6 polarization field including antenna polarization information.

1 30. The multi-bit antenna control signal of claim 29, wherein said plurality of signal
2 components includes said direction field, the direction field including at least three bits.

1 31. The multi-bit antenna control signal of claim 30, wherein the direction field
2 specifies an antenna pattern direction.

1 32. The multi-bit antenna control signal of claim 30, wherein said plurality of signal
2 components further includes said gain field, the gain field including at least two bits used
3 to indicate a level of gain to be applied by an amplifier device in said antenna.

1 33. The multi-bit antenna control signal of claim 30, wherein said plurality of signal
2 components further includes said channel number field, the channel number field
3 including at least three bits used to indicate the number of a broadcast channel to be
4 received by said antenna.

1 34. The multi-bit antenna control signal of claim 30, wherein said plurality of signal
2 components further includes said polarization field, the polarization field including at
3 least one bit used to specify one of a plurality of possible antenna polarizations.

1 35. A method of controlling an antenna, the method comprising the steps of:
2 generating at least one digital control signal including a direction
3 information field and at least one of a gain information field, channel number field, and
4 polarization information field; and
5 transmitting said digital control signal to an antenna.

1 36. The method of claim 35, wherein the step of generating a digital control signal
2 includes:
3 measuring a signal characteristic of a broadcast signal received by said
4 antenna.

1 37. The method of claim 36, wherein the step of generating at least one digital control
2 signal includes:
3 measuring the signal to noise ratio of said received broadcast signal; and
4 wherein the method further comprises automatically sending said antenna
5 multiple digital control signals to modify the direction of the antenna pattern of said
6 antenna in an attempt to find a position which results in a satisfactory signal to noise
7 ratio.

1 38. The method of claim 36, further comprising the step of:
2 receiving antenna capability information from said antenna.

1 39. The method of claim 38, wherein the step of transmitting said digital control
2 signal to an antenna includes the step of transmitting said digital control signal over a
3 serial bus.

1 40. The method of claim 39, further comprising the step of:

2 supplying direct current power to said antenna over a line which is
3 separate from said serial bus.

1 41. The method of claim 40, wherein said step of measuring a signal characteristic of
2 a broadcast signal received by said antenna includes:

3 receiving from said antenna the received broadcast signal via a co-axial
4 cable.

1 42. A method of supporting communications in a portable device, the method
2 comprising:

3 providing a plurality of antennas, each of said plurality of antennas
4 supporting adjustable antenna pattern positions;

5 receiving and decoding a signal using a first one of said plurality of
6 antennas while adjusting the antenna pattern position of a second one of said plurality of
7 antennas during a first period of time; and

8 receiving and decoding a signal using the second one of said plurality of
9 antennas while adjusting the antenna pattern position of the first one of said plurality of
0 antennas during a second period of time.

1 43. The method of claim 42, wherein the first and second periods of time are
2 immediately consecutive periods of time.

1 44. The method of claim 42, wherein said signal is a broadband communications
2 signal.

1 45. The method of claim 42, further comprising, at the end of the first period of time,
2 the step of:

3 operating a switching device to disconnect an output of the first antenna to
4 a signal processor and to connect the output of the second antenna to the signal processor.

1 46. A system for receiving broadcast signals, comprising:

2 a plurality of antennas, each antenna having an antenna pattern with a first
3 region having a first gain and a second region having a second gain lower than said first
4 gain, said second region of each of said plurality of antennas being oriented in a different
5 direction from the second region of at least one other antenna in said plurality of
6 antennas; and

7 a receiver coupled to said plurality of antennas, the receiver including a
8 selection device for selecting an antenna signal, output by one of said plurality of
9 antennas, as a function of a signal noise measurement.

1 47. The system of claim 46,

2 wherein said signal noise measurement is a signal to noise ratio
3 measurement; and

4 wherein said receiver further includes:

5 means for generating said signal to noise ratio measurement from the
6 output of an antenna.

1 48. The system of claim 47, wherein said selection device selects the antenna output
2 signal with the lowest signal to noise ratio.

1 49. The system of claim 46, wherein each of said plurality of antennas has the same
2 physical structure but is mounted in said system with a different physical orientation.

1 50. The system of claim 46, wherein at least one of said plurality of antennas has a
2 steerable antenna pattern.

1 51. A receiver system, the system comprising:
2 an antenna with a steerable antenna pattern, the antenna pattern including a high
3 gain region and a low gain region, the low gain region having a gain which is at least six
4 dB lower than the maximum gain in the high gain region; and

5 an antenna pattern position control module for directing the position of said
6 antenna pattern so that the low gain region is positioned in the direction of a source of
7 signal interference.

1 52. The receiver system of claim 51,
2 wherein said antenna pattern position control module generates digital
3 position control signals; and
4 wherein the antenna further comprises:
5 an antenna pattern position control signal decoder module for decoding
6 said digital position control signals.

1 53. The receiver system of claim 52, wherein said antenna pattern position control
2 module includes:
3 means for determining the signal to noise ratio of a signal received from said
4 antenna; and
5 means for generating said digital antenna pattern position control signals to direct
6 said antenna pattern position to a position which maximizes said signal to noise ratio.